Ground Software

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Top Level Requirements

- Provide Command and Telemetry System for FAME
- System Shall Support Box-Level Testing Through Flight Operations
- Support the EAGE, ELSE, SATSIM, and BP Operations Systems
- Shall Be Compatible With BP's System Architecture
- Shall Follow the FAME CM Plan Using a COTS CM Tool
- Provide Completely Automated Control of the Ground System via an Extendible Script Language
- Provide Limit Checking and Alarm Handling for Telemetry
- Provide Alphanumeric and Graphical Displays
- Provide Telemetry Archive and Playback
- Provide Telemetry/Commanding Reports and Trending
- Automatically Verify and Archive All Formal Test Results
- Control All EAGE/ELSE Hardware (GPIB, Serial, Enet)
- Provide for Flight Memory/Table Loading, Dumping, and Verification
- Shall Use CCSDS Application Packets for Interprocess Communications
- Provide Top-Level FAME Health and Status via an Internet Browser Interface

Current Baseline/Approach

- Complete Automation – Complete Control
- FAME Shall Use an Existing Off-the-Shelf Command and Telemetry (C&T) System Based on the Results of the AOVC Evaluation
- System Shall Use a Sun Solaris Platform for C&T
- Front-End Processor (FEP) Shall Be a VME Chassis Running the VxWorks OS
- Housekeeping Telemetry and Commands Are Passed via Ethernet Between the FEP and the C&T Nodes
- High Speed Data Is Archived on the FEP (FAME Data Is Not High Speed)
- Software Shall Be Written in “C”
- Scripts Shall Be Written in CSH, SH, TCL, or PERL
- Code Reuse Is the Key to Productivity
- The LAN for Formal Testing Shall Be Isolated via Router From the NRLnet
- Shall Support a Heterogeneous Network of Nodes for Off-Line Analysis (PCs and Macs Will Be Able to Mount Our File System to Analyze Data Offline)
- Physical Interfaces Shall Be Isolated From the Application Software via a Separate Executable or Threads (ex., Commanding System and the CEU Handler)
- All Tasks Shall Provide APIs to Isolate and Control

Typical EAGE Design

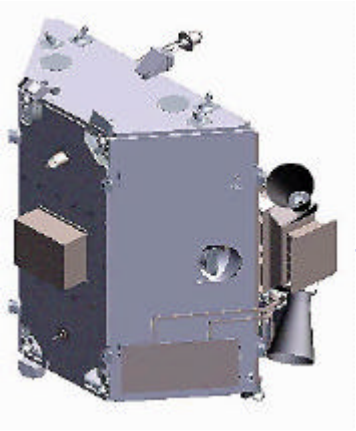
Ground Software Is on Sun Workstation and VME Chassis (VxWorks)

EAGE Rack(s)

C&T Workstation

C&T Workstation (Monitor)

Device Under Test



Connections for Data and Power With Break Out Boxes

BoB

EAGE VME Chassis

Battery Sim

Sig Gen

Receiver

BPU

Power Supply

UPS

Devices Controlled by GPIB Via Enet

100 Mbit Enet for C&T

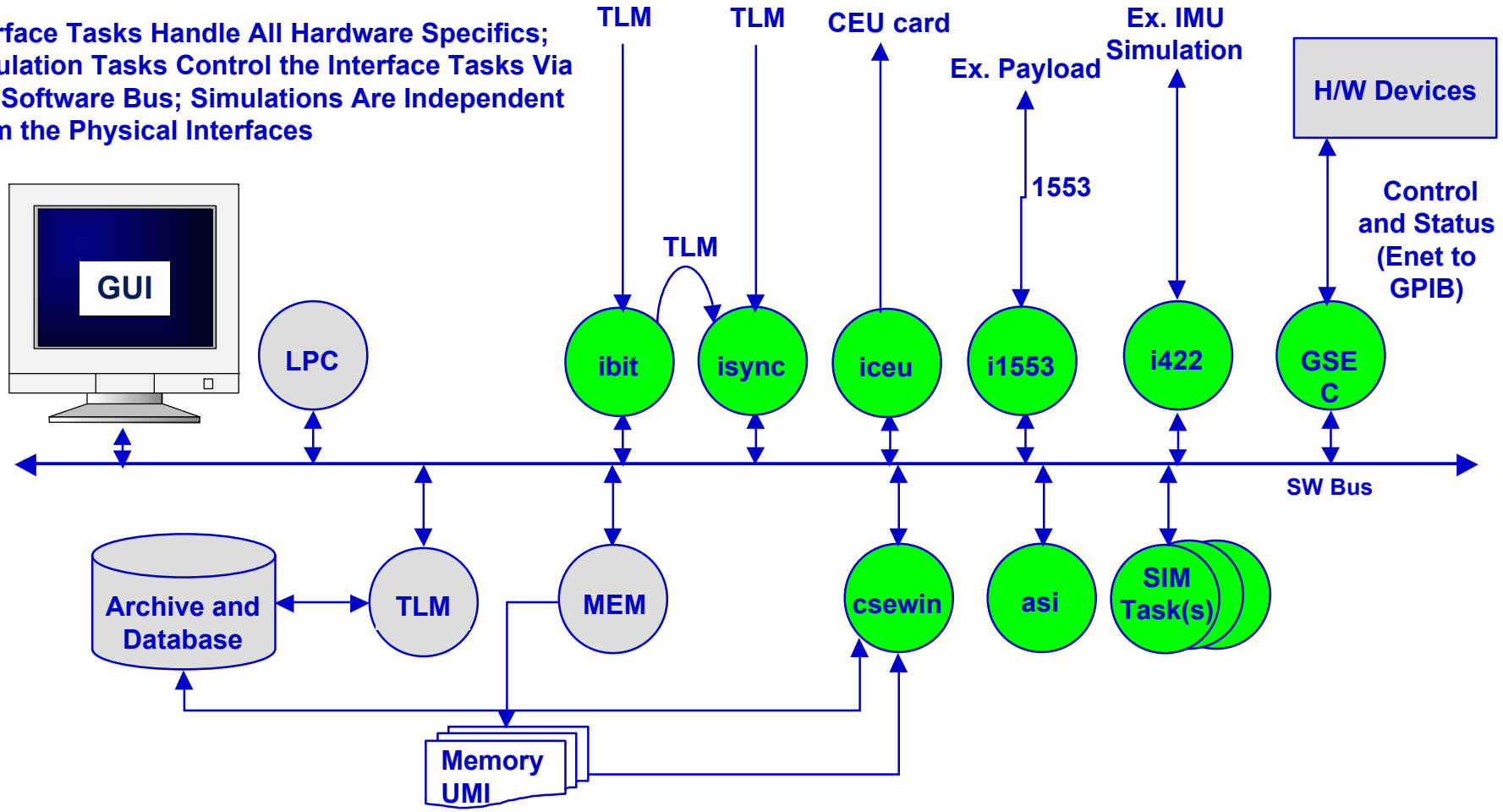
Router

NRL Network

Typical EAGE Ground SW Design

1) The Software Bus Allows Us to Configure Components on Any Node in the LAN; The Telemetry and Commands May Come From/Go to Any Interface (1553, Frame Sync, Serial)

2) Interface Tasks Handle All Hardware Specifics; Simulation Tasks Control the Interface Tasks Via The Software Bus; Simulations Are Independent From the Physical Interfaces



Trade Studies

- **Advanced Operations Validation Center (AOVC) Spacecraft Control Software Evaluation – Systems Under Evaluation Are:**
  - **OSComet (Software Technology Inc.)**
  - **SCL (Interface and Control Systems, Inc)**
  - **ITOS (NASA)**
  - **Epoch 2000 (Integral Systems)**
  - **SCS-21 (Lockheed-Martin)**
- **System Will Be Chosen 11/2000**
- **http://www.sgss.com/aovc.htm by Eric Karlin (321-956-8200 x17)**

Issues

- **Close Loop Simulation Requirements**
- **Payload Test Support With Lockheed**

Top Level Schedule

• AOVC Ends	Oct 2000
• FEP SRS Available	Oct 2000
• FEP Design Review	Nov 2000
• C&T System Chosen	Nov 2000
• CM System Chosen	Nov 2000
• FAME SRR	Nov 2000
• EAGE SRS Available	Mar 2001
• FAME PDR	May 2001
• EAGE Design Review	July 2001
• FEP Complete	Sep 2001
• Space/Ground ICD Available	Oct 2001
• EAGE System Demonstration	Dec 2001
• FAME CDR	Feb 2002
• EAGE System Available for Test	Apr 2002